

PLANNING DEPARTMENT

TED JAMES, AICP, Director

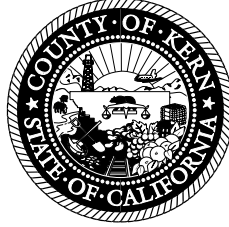
2700 "M" STREET, SUITE 100
BAKERSFIELD, CA 93301-2323

Phone: (661) 862-8600

FAX: (661) 862-8601 TTY Relay 1-800-735-2929

E-Mail: planning@co.kern.ca.us

Web Address: www.co.kern.ca.us/planning



RESOURCE MANAGEMENT AGENCY

DAVID PRICE III, RMA DIRECTOR

Community & Economic Development Department

Engineering & Survey Services Department

Environmental Health Services Department

Planning Department

Roads Department

GUIDELINES FOR PREPARING AN AIR QUALITY ASSESSMENT FOR USE IN ENVIRONMENTAL IMPACT REPORTS

The Kern County Planning Department has developed the following guidelines to assist with the preparation of the air quality assessments for use as a technical document in Environmental Impact Reports prepared by the Department. These guidelines are intended to ensure that the assumptions and methodology used in the County's environmental documents are uniform from one project to the next to facilitate the comparison of air quality environmental effects. **All assumptions used are to be reasonably conservative and realistic.** The following is intended as minimum guidance and is to be augmented, as appropriate, by the professional judgment of the air quality preparer in consultation with planning staff. Air Quality Assessments that are submitted without this information, unless such deletions are approved by staff, may be required to be rewritten.

Models

The latest version of all models shall be used for the appropriate application. It is the responsibility of the air quality preparer to use professional judgment in ensuring that the very latest version of a model is used. For purposes of timing, the determination of whether a model is current or not shall be based on when the EIR is being printed for distribution to the public, not when the administrative draft is submitted to the County. Caution should be used in preparing a study based on a model that is known to be in the process of being revised, replaced or updated.

Specific Instructions

1. A complete project description including construction and operational aspects of the project, in addition to including traffic generation figures that are consistent with any submitted traffic studies.
2. Estimates of short-term construction emissions in tons per year. The estimates shall include both site grading and building construction emissions with comparison to the adopted Kern County California Environmental Quality Act (CEQA) thresholds (Attachment A) and the applicable Air District (San Joaquin Valley Air Pollution Control District and/or Kern County Air Pollution Control District) thresholds. The current version of URBEMIS 2002 (i.e Version 8.7 now or new version to be released first quarter of 2007) model, EMFAC 2007 OFFROAD 2007 or other documented approach, pre-reviewed and approved by Planning staff, shall be used. All assumptions are to be clearly presented, including length of each construction phase, equipment that will be used during each phase and the amount of soil disturbance, including any import or export of soil. The emission factors used to estimate emissions shall be clearly documented. The model output shall be included in the report.

3. Estimates of long term operational emissions in tons per year. The current version of URBEMIS 2002 (i.e Version 8.7 now or new version to be released first quarter of 2007) model, or EMFAC 2007 model shall be used with comparison to the adopted Kern County CEQA thresholds and the applicable Air District (San Joaquin Valley Air Pollution Control District and/or Kern County Air Pollution Control District) thresholds. All assumptions are to be clearly presented, including any phasing, year of complete buildout, number of vehicle trips including, if applicable, residential, and commercial, employees, delivery, and other trucks. The emission factors used to estimate emissions shall be clearly documented. All defaults used shall be clearly defined in the form of a project description. The model output shall be included in the report.
4. CO Hotspot analysis using the CALINE4 Model for the following project conditions: a) Level of Service (LOS) of an intersection or roadway identified as Level of Service (LOS) E or worse; b) signalization and/or channelization is added to an intersection and c) sensitive receptors such as residences, schools, hospitals, etc are located in the vicinity of the affected intersection or signalization. If no such conditions exist, then the assessment shall include that information and note the reasons the CO Hotspot analysis was not required. The model output shall be included in the report.
5. SCREEN3 or AERMOD modeling of maximum 24 –hour average concentration of Primary PM10 and PM2.5 at the project boundary, with comparison to National Ambient Air Quality Standards (NAAQS), Kern County CEQA thresholds and the applicable Air District (San Joaquin Valley Air Pollution Control District and/or Kern County Air Pollution Control District) thresholds. The model output shall be included in the report.
6. SCREEN3 or AERMOD modeling of maximum 24–hour average concentrations of odorous compounds at the project boundary and within a six mile limit identifying the location of any residences, schools, or other sensitive receptors, including approved, but not constructed sensitive receptors, with comparison to odor thresholds and CEQA impact thresholds. The model output shall be included in the report.
7. Impacts to visibility are to be evaluated for all industrial projects and any other projects, such as mining projects, that have components that could generate dust or emissions related to visibility. All Class 1 areas located within 100 kilometers of the project site, Edwards Air Force Base, China Lake Naval Weapons Station and the entire R-2508 Airspace Complex shall be included in the analysis.
8. Estimates of all stationary source equipment and whether it is subject to the applicable air district registration or permitting. Include fuel type, maximum rated horsepower, and annual fuel usage and emission estimates for NOx, CO, ROG, PM10, PM2.5 and SOx. The emission factors used shall be based on US EPA AP 42–emission factors and/or vendor guarantees. If EPA emission factors are used, then specific emission factor (chapter of AP-42 and the date of the publication) shall be included in documentation. If vendor guarantees are used, a copy of these guarantees shall be included. The model output shall be included in the report.
9. As part of the preparation of the Air Quality Assessment, a determination as to the need for a health risk assessment (HRA), analyzing the acute, chronic, and carcinogenic health risks of pollutants, including Toxic Air Contaminants (TAC), that would be emitted during project operations shall be made in consultation with staff. The HRA shall evaluate the risks of

pollutants such as diesel exhaust and any other pollutants emitted by the project that have been identified as acute, chronic, or carcinogenic substances by the California Office of Environmental Health Hazard Assessment. The model output shall be included in the report. The most recent version of the California Air Resources Board's HARP model shall be used to conduct the HRA. Use of other documented approach instead of the HARP model must be discussed and approved by Planning staff prior to completion of the report. The model output shall be included in the report.

10. Tables showing all construction and all operational emissions in tons per year, with a comparison to Kern County CEQA thresholds shall be included. Tables shall be shown with unmitigated emissions and mitigated emissions.
11. The San Joaquin Valley Air Pollution Control District Air Quality Mitigation Checklist, which has been developed for use with Rule 9510 (Indirect Source Rule), (Attachment B) along with any other recommendations from the applicable air district, shall be consulted for feasible and reasonable mitigation, regardless of the air basin. Mitigation that is not being recommended for inclusion from the checklist or from the air district shall be discussed with staff before completion of the assessment. A summary section shall be included that details all design features used in the modeling as well as all recommended mitigation measures.
12. Projects within the San Joaquin Valley Air Pollution Control District subject to Rule 9510 (Indirect Source Rule) should discuss the project's compliance with the requirements of the program. Emission reductions from compliance with the rule may be shown on the table for emissions as mitigated reductions.
13. Projects that choose to enter into a Voluntary Emission Reduction Program (VERP) with the San Joaquin Valley Air Pollution Control District may discuss the program as a design feature. It is not to be discussed or labeled as a mitigation measure. Use of this program shall not substitute for any of the emission estimates required by these guidelines.
14. The most recent air quality guidance documents from the Kern County Air Pollution Control District and the SJVAPCD, such as the Guide For Assessing and Mitigation Air Quality Impacts (GAMAQI) shall be used and referenced in the preparation of this assessment. However, where the Planning Department guidelines require quantification and the air district does not, for purposes of CEQA, the Planning Department guidelines shall be followed. Discussion and consultation with the appropriate air district and Planning staff is recommended.
15. A complete description of all air pollutants and their associated health effects shall be included. All pollutants should be included, even if the project does not generate those pollutants. A discussion of Valley Fever and AB 32 – Greenhouse Gases: California Global Warming Solutions Act of 2006. An example of the typical scope of discussion required is attached. (Attachment C).
16. The cumulative impact assessment shall include all of the following. Certain specialized projects may require a modification of this approach in consultation with planning staff.
 - a. Localized Impacts. Using a list of projects within a one mile and six mile radius of the project boundaries estimate impacts. Depending on the type of project, the impacts may include odors, Toxic Air Contaminants, NO_x, ROG, CO, PM 10 and PM 2.5.

- b. Consistency with Existing Air Quality Plans
 - 1. Discuss project in relation to KernCog conformity and Traffic Analysis Zones.
 - 2. Quantify the emissions from similar projects in the Ozone Attainment plan for the applicable basin. Discuss the Ozone Attainment plan for the applicable air district, development and relation to regional basin, Triennial Plan and State Implementation Plan.

- c. CARB Air Basin Emissions

Download the Air Basin Emissions from the CARB website. Create tables showing the following:

 - i. Current year Kern County portion of the air basin
 - ii. Current year for the entire air basin.
 - iii. Year 2020 – Kern County portion of the air basin
 - iv. Year 2020- entire air basin
 - v. Composite Table showing total of all results and Project results

An example of presentation is attached (Attachment D)

ATTACHMENT A -

Excerpt from Kern County CEQA Implementation Document (June, 2004)

5.0 THRESHOLDS OF ENVIRONMENTAL SIGNIFICANCE

Adopting thresholds of significance promotes consistency, efficiency and predictability in the process of determining the significance of environmental effects. The following thresholds of significance are adopted by the Board of Supervisors for use in all evaluations and environmental documents prepared by County Departments with duties affected by CEQA.

5.1 Air Quality

Projects that produce emissions that exceed the following thresholds shall be considered significant for a project level and/or cumulatively for impacts to air quality. The following thresholds are defined for purposes of determining cumulative effects as the baseline for "considerable". Projects located in the San Joaquin Valley Air Pollution Control District and Kern County Air Pollution Control District will be subject to the following significance thresholds specified for each air district.

5.1.1 San Joaquin Valley Air Pollution Control District

<u>ROG</u>	<u>NO_x</u>	<u>PM₁₀</u>	<u>(tons per year) *</u>
10	10	15	

Stationary Sources

Severe Nonattainment 25 tons per year
(2004 Environmental Protection Agency designation)

Extreme Nonattainment 10 tons per year
(requested / pending Environmental Protection Agency designation)

*ROG – Reactive organic gases, also called volatile organic compounds (VOC),

NO_x - Oxides of Nitrogen, PM₁₀ - Particulate matter that is 10 microns in diameter or smaller.

5.1.2 Kern County Air Pollution Control District

<u>ROG</u>	<u>NO_x</u>	<u>PM₁₀</u>	<u>(tons per year) *</u>
25	25	15	

Stationary Sources

25 tons per year

*ROG – Reactive organic gases, also called volatile organic compounds (VOC),
NO_x - Oxides of Nitrogen, PM₁₀ - Particulate matter that is 10 microns in diameter or smaller

SAN JOAQUIN VALLEY UNIFIED AIR POLLUTION CONTROL DISTRICT

Draft Staff Report: Rules 3180 and 9510

June 30, 2005

ATTACHMENT B

APPENDIX C

On-Site Mitigation Checklists

June 30, 2005

DRAFT
Mixed Use or Non-Residential On-Site Mitigation Checklist

No.	Description	Selected? Y/N	Location	Enforcement Mechanism or Justification for Non-Selection
Bicycle Infrastructure				
1	Add or locate project with Class I or II bike lanes on arterial/collector streets, or where a suitable parallel route exists.			
Mass Transit Infrastructure				
	Project is located within 1/4-1/2 mile of a transit stop.			
2	<ul style="list-style-type: none"> * Office floor area ratio is 0.75 greater within 1/4 mile of existing transit stop. * Project is located within one mile of a park and ride lot operated by a transportation agency. * Other trip reduction services on site or within 1/4 mile of site. 			
Mixed Use/Density				
	High density residential, mixed, or retail/commercial uses on site or within a 1/2 mile of project center to minimize the need for trips, including:			
	* Day care facilities			
	* Restaurant or cafeteria			
	* Bank or ATM			
	* Dry cleaners			
	* Post office/services			
	* Entertainment (movie/video)			
	* Recreation facility/fitness center			
	* Public Park			
	* Residential development/On-site employee living spaces			
4	Average Residential density is 7 Dwelling Units (DU) per acre or greater			
	* Project contains ancillary residential units - "Granny Flats"			
	Include Affordable Housing/Senior Housing/ Assisted Living			
5	Designate a portion of residential units as deed-restricted below-market-rate (BMR) housing.			
Bicycle/Pedestrian				
Bicycle Storage				
	Provide Class I and Class II bicycle parking facilities on-site. One bicycle parking space for every 10 car parking spaces is considered appropriate. Bicycle parking facilities should be near destination points and easy to find. At least one bicycle parking space for every 20 vehicle parking spaces			
6	Provide secure bicycle storage at public parking facilities.			
7	Provide shower and locker facilities to encourage employees to bike and/or walk to work, typically one shower and three lockers for every 25 employees.			
8	Provide secure bicycle storage (Class I) at apartment complexes or condos without garages			
9				
Pedestrian Oriented Infrastructure				
	Complete, Separate, safe, and convenient pedestrian sidewalks/paths connecting multiple uses. This can be implemented through:			
	* Provide direct pedestrian connections			

DRAFT

No.	Description	Selected? Y/N	Enforcement Mechanism or Justification for Non-Selection
10	<ul style="list-style-type: none"> * Provide paths and building access which are physically separated from street parking lot traffic and that eliminates physical barriers such as walls, berms, landscaping and slopes that impede the use of pedestrians, bicycle facilities, or public transportation vehicles * Provide pedestrian signalization and signage to improve pedestrian safety * Provide continuous sidewalks separated from the roadway by landscaping and on-street parking. * Provide clearly delineated crosswalks at intersections. * Provide on and off-site pedestrian facility improvements such as overpasses and wider sidewalks * Provide on and off-site pedestrian facility improvements such as trails linking them to designated pedestrian commuting routes and/or on-site overpasses and wider sidewalks. * Provide street lighting * Provide shaded pathways (e.g. provide street trees or building overhangs) * Link cul-de-sacs and dead-end streets to encourage pedestrian and bicycle travel; * Provide traffic calming modifications to project roads, such as narrower streets, speed platforms, bulb-outs and intersection modifications designed to reduce vehicle speeds, to encourage pedestrian and bicycle travel. * Provide a parking lot design that includes clearly marked and shaded pedestrian pathways between transit facilities and building entrances * Provide pedestrian access between bus service and major transportation points and destination points within the project. 		
11	<ul style="list-style-type: none"> Minimize building setback to adjacent existing or planned pedestrian infrastructure * Setback distance is minimized between development and transit, bicycle, or pedestrian corridor * Setback distance is minimized between development and neighboring properties 		
Transportation Design			
Signage			
12	Provide a display case or kiosk displaying transportation information in a prominent area accessible to employees, residents, or visitors		
Transit Support			
13	<ul style="list-style-type: none"> Include transit support features in the project where feasible and deemed appropriate by the local agency with jurisdiction over the project as demand and service routes warrant subject to review and approval by local transportation planning agencies, including (but not limited to): * on-site/off-site turnouts * Provide route signs and displays * Provide bus turnouts/bulbs * Provide street lighting 		

DRAFT

No.	Description	Selected? Y/N	Enforcement Mechanism or Justification for Non-Selection
	<ul style="list-style-type: none"> * passenger benches * shelters at transit access points 		
14	Develop park-and-ride lots		
Streets			
15	Project design should use models put forward by the Local Government Commission (LGC) in the "Smart Growth Guidebook," such as; street block patterns that form an interconnected grid, short block faces, numerous alleys and narrow streets. (# of intersections in URBEMIS)		
16	Make street design/speeds consistent with requirements for neighborhood electric vehicles		
Parking			
Strategies: Pricing and Preferential Parking			
17	Parking pricing strategies, such as charging parking lot fees to low occupancy (single occupant vehicles) vehicles.		
18	Provide preferential parking spaces near the entrance of the building(s) for those who carpool/vanpool/rideshare and provide signage.		
Parking Amount			
Provide parking reduction. The following are some guidelines:			
19	<ul style="list-style-type: none"> * Office 25% * Medical office 8% * Commercial 5% * Industrial 10% * Additional 10-20% if located along transit station 		
20	Use of any excess parking over zone code requirements as on-site parking-n-ride lots or contribute to construction of off-site lots		
Parking Construction			
21	Provide a parking lot design that includes clearly marked and shaded pedestrian pathways between transit facilities and building entrances		
22	Loading and unloading facilities for transit and carpool/vanpool users. (Provide Signage)		
23	Provide-grass paving or reflective surface paving for unshaded parking lot areas, driveways, or fire lanes that reduce standard paving by 10% or more. <ul style="list-style-type: none"> * Portland concrete is the preferred paving material * Other reflective surfaces to be determined in consultation with SJVAPCD. * "Chip Seal" methodology * Green Pavement http://www.invisiblestructures.com/GP2/grasspave.htm 		
24	Provide electric vehicle charging facilities with preferential parking		
Building/Site Design			
Energy Efficiency			
Increase the building energy efficiency rating above what is required by Title 24 requirements. This can be accomplished by a combination of the following:			
<i>General</i>			
<ul style="list-style-type: none"> * Participate in and implement available PG&E energy-efficient rebate programs including air conditioning, gas heating, refrigeration, and lighting programs. 			

DRAFT

**Enforcement Mechanism or
Justification for Non-Selection**

Selected?
Y/N

No.	Description	Selected? Y/N	Enforcement Mechanism or Justification for Non-Selection
	<ul style="list-style-type: none"> * Install efficient heating and other appliances, such as water heaters, cooking equipment, refrigerators, furnaces and boiler units beyond Title 24 requirements (see Title 24, Part 6, Energy Efficiency Standards for Residential and Nonresidential Buildings: http://www.energy.ca.gov/title24/standard) * Capture waste heat and re-employ it in nonresidential buildings. * Improve the thermal integrity/efficiency of buildings, and reduce the thermal load with automated and timed temperature controls or occupant sensors. 		
	Roof		
	<ul style="list-style-type: none"> * Install "Green Roof" Technology * Install EPA/DOE Energy Star labeled roof materials * Install roof photovoltaic energy systems as a standard feature (on new homes) 		
	Solar Design		
	<ul style="list-style-type: none"> * Design buildings with proper orientation, fenestration, and other design components that maximize the potential of passive cooling and heating, include shading master plan 		
	Components		
25	<ul style="list-style-type: none"> * Use devices that minimize the combustion of fossil fuels. * Install low nitrogen oxide (NOx) hot water heaters. * Install high efficiency Energy Star heating or ground source heat pumps * Install energy efficient interior lighting. * Install built-in energy efficient appliances. * Install door sweeps and weather stripping if more efficient doors and windows are not available. * Install energy-efficient and automated controls for air conditioning * Install of energy-efficient lighting (includes controls) and process systems such as water heaters, furnaces and boiler units. * Install electrical outlets on the exterior walls of both the front and back of residences or all commercial buildings to promote the use of electric landscape maintenance equipment. * Install electric vehicle recharging station with both conductive and inductive charging capabilities in residential garages / parking lots. * Install a gas outlet for use with outdoor cooking appliances, and in any proposed fireplaces, including outdoor recreational fireplaces or pits. * Use low energy street lights (i.e. sodium). * Use low energy traffic signals (i.e. light emitting diode). * Install Medium Efficiency Filters * Install High Efficiency Filters * Install HEPA (High Efficiency Particle Arrestance) Filters * Install "whole-house" or "fresh-air" ventilation system 		
	Telecommuting Infrastructure		
	<ul style="list-style-type: none"> * Provide necessary infrastructure for telecommuting * Provide fiber optic wiring and connections * Provide T1 wiring and connections * Install a teleconferencing facility * Install a on-site telecommunications center 		
26			

DRAFT

No.	Description	Selected? Y/N	Enforcement Mechanism or Justification for Non-Selection
	Build new homes with internal wiring/cabling that allows telecommuting, teleconferencing, and telelearning to occur simultaneously in at least 3 locations in each home		
Building Maintenance/Indoor Air Quality			
27	Reduce VOC emissions from Architectural Coatings <ul style="list-style-type: none"> * Use Low-VOC Coatings * Use No-VOC Coatings 		
28	Install an ozone destruction catalyst on all air conditioning systems.		
Landscaping			
29	Trees should be carefully selected and located to protect the building(s) from energy consuming environmental conditions and to shade paved areas		
	Write and implement a Master Shading Plan which includes a maintenance plan.		
30	<ul style="list-style-type: none"> * Plant Low-OPP, native, drought-resistant, tree and shrub species, 20% in excess of that already required by city or county ordinance. Consider roadside, sidewalk, and driveway shading * Trees should be selected and located to shade paved areas that will shade 50% or more of the pavement within 15 years. * Follow City of Sacramento's Parking Lot Tree Shading Design and Maintenance Guidelines. 		
31	Tree pruning should be consistent with the International Society of Arboriculture (ISA) and the American National Standards Institute (ANSI) standards		
32	Require landscape maintenance companies to use battery powered or electric equipment.		
33	Use structural soil under paved areas to improve tree growth		
34	Landscape with low-emission native drought-resistant species (plants, trees and bushes) to reduce the demand for gas powered landscape maintenance equipment. Contact the District for a list of low-emission trees and shrubs.		
Operational Measures			
Telecommunication			
35	Provide free-access telework terminals in multi-family projects		
36	Provide a community videoconferencing system coordinated with TMA.		
	Implement an employee telework policy <ul style="list-style-type: none"> * Install videoconferencing system * Include teleconferencing capabilities, such as web cams or satellite linkage, which will allow employees to attend meetings remotely without requiring them to travel out of the area. * Offer low cost financing to employees for the purchase of telecommuting equipment, or lend company-owned equipment. * Provide satellite work offices when appropriate. Applicable to office/industrial and educational institutions. 		
37			
38	Design "Shop by Telephone" or "Shop-by-Computer" services. Applicable to shopping centers and retail facilities.		
Alternative Transit			
39	Provide Guaranteed Ride Home		

DRAFT

No.	Description	Selected? Y/N	Enforcement Mechanism or Justification for Non-Selection
40	Carpool Matching Assistance		
41	Provide Car-Sharing Services Employ or appoint an Employee Transportation Coordinator to work with the TMA and the District * Provide individual private telephones for patients at medical facilities, which allows for "visits without trips." * Implement a rideshare program * Provide incentives to employees to carpool/vanpool, take public transportation, telecommute, walk, bike, etc. * Participate in an employee "flash-pass" program, which provides free travel on transit buses. * transit pass subsidy (100%) and/or commute alternative allowance * alternative transportation programs such as CalTrans rideshare where deemed appropriate by local transportation planning agencies and/or APCD		
42	Transit-use incentives, as approved by applicable transportation planning agencies such as subsidized transit passes and accommodation of unusual work schedules to encourage transit use * Provide funds for on line computer rideshare matching. * An employer subsidized shuttle service to connect to existing transit sites. * An employer subsidized free or reduced transit fares for midday central business district trips. * Provide financial incentives to carpools for vehicle tune-up or maintenance * Implement a lunchtime shuttle to reduce single occupant vehicle trips. * Provide Flextime for non-SOV (single occupancy vehicle) commuters * Maintain a fleet of bicycles for employee and business use * Transit pass subsidy (100%) and/or commute alternative allowance		
43	Transit pass subsidy (100%) and/or commute alternative allowance Provide a display case or kiosk displaying transportation information in a prominent area accessible to employees or residents. * Provide ridesharing information in a homeowner's association package. * Provide an opportunity to receive either a complimentary bicycle or electric bicycle retrofit kit to each residential buyer * "Validation" of a transit ticket to provide free return trip. Applies to shopping centers, hospitals/medical facilities, and retail facilities. * Sell transit passes. Applies to retail facilities, educational institutions, resorts/hotels, and office/industrial complexes. * Provide electric shuttle or minibus service to transit stops * Provide free transfers between all shuttles and transit. * Operation of a shuttle bus to shopping, health care, public services sites and other nearby trip attractors to reduce automobile use.		
44	Work Schedules		

DRAFT

No.	Description	Selected? Y/N	Enforcement Mechanism or Justification for Non-Selection
45	Alternative work schedules such as compressed workweek schedules where weekly work hours are compressed into fewer than five days. Examples of these options are : 9/80, 4/40, 3/36		
Goods Movement			
46	Establish delivery services. Applicable to retail facilities (frequent use), shopping centers, and restaurants.		
47	If the development is a grocery store or large retail facility, provide home delivery service for customers.		
48	Schedule goods movement for off-peak traffic hours.		
Landscaping			
Project provides and/or requires use of electric maintenance equipment, including, but not limited to electric lawn mowers, electric leaf blowers, etc.			
* Prohibit gas powered landscape maintenance equipment within developments.			
49	Contract only with commercial landscapers who operate with equipment that complies with the most recent California Air Resources Board certification standards, or standards adopted no more than three years prior to date of use.		
* Provide battery powered or electric landscape maintenance equipment for new residences, commercial and industrial land uses.			
Fleet / Engines			
Implement clean air business practices such as using low-emission delivery vehicles, contract with alternative-fuel waste hauling companies, contracting with carrier, delivery, security, or other services utilizing electric, low-emission, alternative fuel, convert fleet to cleaner vehicles or utilizing heavy-duty vehicles that are CARB certified to optional low-emission standards for NOx.			
<i>Medium Trucks - 5,751 to 8,500 lbs</i>			
* ESW Particulate Reactor			
* PuriNOx Emulsified Diesel fuel			
* CCRT Particulate Filter			
* CRT Particulate Filter			
* Cleaire Longview (ultra low diesel)			
<i>Light Heavy - 8,501 to 10,000 lbs</i>			
* DCM DOC Muffler w/series 6000 or 6100 catalyst			
* ESW Particulate Reactor			
* PuriNOx Emulsified Diesel fuel			
* CCRT Particulate Filter			
* CRT Particulate Filter			
* Cleaire Longview (ultra low diesel)			
<i>Light Heavy - 10,001 to 14,000 lbs</i>			
* DCM DOC Muffler w/series 6000 or 6100 catalyst			
* ESW Particulate Reactor			
* PuriNOx Emulsified Diesel fuel			
* CCRT Particulate Filter			
* CRT Particulate Filter			
* Cleaire Longview (ultra low diesel)			

DRAFT

No.	Description	Selected? Y/N	Enforcement Mechanism or Justification for Non-Selection
	<i>Medium Heavy - 14,001 to 33,000 lbs</i>		
	* AZ Purifier & AZ Purimuffler (Cummins & Navistar: 1991-03)		
	* DCM DOC Muffler w/series 6000 or 6100 catalyst		
	* ESW Particulate Reactor		
	* PuriNOx Emulsified Diesel fuel		
	* DPM DPF muffler with/series 6300 catalyst formulation		
	* CCRT Particulate Filter		
	* CRT Particulate Filter		
	* Lubrizol Engine Control Systems Purifier		
	* Cleaire Longview (ultra low diesel)		
	<i>Heavy Heavy - 33,001 to 60,000 lbs</i>		
	* DCM DOC Muffler w/series 6000 or 6100 catalyst		
	* Cleaire Flash and Match oxidation catalyst		
	* ESW Particulate Reactor		
	* PuriNOx Emulsified Diesel Fuel		
	* DPM DPF muffler w/series 6300 catalyst formulation		
	* CCRT Particulate Filter		
	* CRT Particulate Filter		
	* Lubrizol Engine Control Systems Purifier		
	* Cleaire Flash Match system (Cummins M11 engines only)		
	* Cleaire Longview (ultra low diesel)		
	<i>Line Haul Vehicles > 60,000 lbs</i>		
	* DCM DOC Muffler w/series 6000 or 6100 catalyst		
	* Cleaire Flash and Match oxidation catalyst		
	* ESW Particulate Reactor		
	* PuriNOx Emulsified Diesel Fuel		
	* DPM DPF muffler w/series 6300 catalyst formulation		
	* CCRT Particulate Filter		
	* CRT Particulate Filter		
	* Lubrizol Engine Control Systems Purifier		
	* Cleaire Flash Match system (Cummins M11 engines only)		
	* Cleaire Longview (ultra low diesel)		
	<i>Urban Bus</i>		
	* ESW Particulate Reactor		
	* PuriNOx Emulsified Diesel Fuel		
	* CCRT Particulate Filter		
	* CRT Particulate Filter		
	* Cleaire Longview (ultra low diesel)		
	<i>School Bus</i>		
	* ESW Particulate Reactor		
	* PuriNOx Emulsified Diesel Fuel		
	* CCRT Particulate Filter		
	* CRT Particulate Filter		
	* Cleaire Longview (ultra low diesel)		
	<i>General</i>		
	* Utilize electric fleet vehicles		
	* Utilize Ultra Low-Emission fleet vehicles		
	* Utilize methanol fleet vehicles		

DRAFT

No.	Description	Selected? Y/N	Enforcement Mechanism or Justification for Non-Selection
	<ul style="list-style-type: none"> * Utilize liquid propane gas fleet vehicles * Utilize compressed natural gas fleet vehicles * Replace diesel fleet with alternative fuel engine technology and infrastructure * Retrofit existing equipment to reduce emissions using methods such as particulate filters, oxidation catalysts, or other approved technologies. * Fleet vehicles that use clean-burning fuels as may be practicable * Adopt a Vehicle Idling Policy requiring all vehicles under company control to adhere to a 5 minute idling policy. * Conversion to cleaner engines * Use of cleaner (reduced sulfur) fuel * Regular maintenance – keep equipment well tuned * Add-on control devices, e.g., particulate traps, catalytic oxidizers * Repower/Retrofit heavy-duty diesel fleet with cleaner diesel engine technology and/or diesel particulate filter after-treatment technology * Replace diesel fleet with alternative fuel engine technology and infrastructure * Replace auxiliary power units with cleaner engine technology, alternative fuels, or require electric connection while at loading dock * Replace diesel fleet vehicles with cleaner fueled low emission vehicles (i.e. school buses, buses, on- and off- road heavy duty vehicles, lighter duty trucks and passenger vehicles) 		

DRAFT

Residential-Only On-Site Mitigation Checklist

No.	Description	Selected? Y/N	Location	Enforcement Mechanism or Justification for Non-Selection
Bicycle Infrastructure				
1	Add or locate project with Class I or II bike lanes on arterial/collector streets, or where a suitable parallel route exists.			
Mass Transit Infrastructure				
2	Project is located within 1/4-1/2 mile of a transit stop. * Other trip reduction services on site or within 1/4 mile of site.			
Mixed Use/Density				
3	High density residential, mixed, or retail/commercial uses on site or within a 1/2 mile of project center to minimize the need for trips, including: * Day care facilities * Restaurant or cafeteria * Bank or ATM * Dry cleaners * Post office/services * Entertainment (movie/video) * Recreation facility/fitness center * Public Park * Residential development/On-site employee living spaces			
4	Average Residential density is 7 Dwelling Units (DU) per acre or greater * Project contains ancillary residential units - "Granny Flats" Include Affordable Housing/Senior Housing/ Assisted Living			
5	Designate a portion of residential units as deed-restricted below-market-rate (BMR) housing.			
Bicycle Storage				
6	Provide secure bicycle storage (Class I) at apartment complexes or condos without garages			
Pedestrian Oriented Infrastructure				
7	Complete, Separate, safe, and convenient pedestrian sidewalks/paths connecting multiple uses. This can be implemented through: * Provide direct pedestrian connections * Provide paths and building access which are physically separated from street parking lot traffic and that eliminates physical barriers such as walls, berms, landscaping and slopes that impede the use of pedestrians, bicycle facilities, or public transportation vehicles. * Provide pedestrian signalization and signage to improve pedestrian safety * Provide continuous sidewalks separated from the roadway by landscaping and on-street parking. * Provide clearly delineated crosswalks at intersections. * Provide on and off-site pedestrian facility improvements such as overpasses and wider sidewalks			

DRAFT

No.	Description	Selected? Y/N	Enforcement Mechanism or Justification for Non-Selection
7	<ul style="list-style-type: none"> * Provide on and off-site pedestrian facility improvements such as trails linking them to designated pedestrian commuting routes and/or on-site overpasses and wider sidewalks. * Provide street lighting * Provide shaded pathways (e.g. provide street trees or building overhangs) * Link cul-de-sacs and dead-end streets to encourage pedestrian and bicycle travel * Provide traffic calming modifications to project roads, such as narrower streets, speed platforms, bulb-outs and intersection modifications designed to reduce vehicle speeds, to encourage pedestrian and bicycle travel. * Provide pedestrian access between bus service and major transportation points and destination points within the project. 		
Transportation Design			
Signage			
8	Provide a display case or kiosk displaying transportation information in a prominent area accessible to residents, or visitors		
Transit Support			
	Include transit support features in the project where feasible and deemed appropriate by the local agency with jurisdiction over the project as demand and service routes warrant subject to review and approval by local transportation planning agencies, inc		
9	<ul style="list-style-type: none"> * on-site/off-site turnouts * Provide route signs and displays * Provide bus turnouts/bulbs * Provide street lighting * passenger benches * shelters at transit access points 		
Streets			
10	Project design should use models put forward by the Local Government Commission (LGC) in the "Smart Growth Guidebook," such as: street block patterns that form an interconnected grid, short block faces, numerous alleys and narrow streets. (# of intersect		
11	Make street design/speeds consistent with requirements for neighborhood electric vehicles		
Parking			
Parking Construction			
12	Provide-grass paving or reflective surface paving for unshaded parking lot areas, driveways, or fire lanes that reduce standard paving by 10% or more. <ul style="list-style-type: none"> * Portland concrete is the preferred paving material * Other reflective surfaces to be determined in consultation with SJVAPCD. * "Chip Seal" methodology * Green Pavement http://www.invisiblestructures.com/GP2/grasspave.htm 		
Building/Site Design			
Energy Efficiency			

DRAFT

No.	Description	Selected? Y/N	Enforcement Mechanism or Justification for Non-Selection
	Increase the building energy efficiency rating above what is required by Title 24 requirements. This can be accomplished by a combination of the following:		
	<i>General</i>		
	* Participate in and implement available PG&E energy-efficient rebate programs including air conditioning, gas heating, refrigeration, and lighting programs.		
	* Install efficient heating and other appliances, such as water heaters, cooking equipment, refrigerators, furnaces and boiler units beyond Title 24 requirements (see Title 24, Part 6, Energy Efficiency Standards for Residential and Nonresidential Building)		
	* Improve the thermal integrity/efficiency of buildings, and reduce the thermal load with automated and timed temperature controls or occupant sensors.		
	<i>Roof</i>		
	* Install "Green Roof" Technology		
	* Install EPA/DOE Energy Star labeled roof materials		
	* Install roof photovoltaic energy systems as a standard feature (on new homes)		
	<i>Solar Design</i>		
	* Design buildings with proper orientation, fenestration, and other design components that maximize the potential of passive cooling and heating, include shading master plan		
	<i>Components</i>		
	* Use devices that minimize the combustion of fossil fuels.		
	* Install low nitrogen oxide (NOx) hot water heaters.		
	* Install high efficiency Energy Star heating or ground source heat pumps		
	* Install energy efficient interior lighting.		
	* Install built-in energy efficient appliances.		
	* Install door sweeps and weather stripping if more efficient doors and windows are not available.		
	* Install energy-efficient and automated controls for air conditioning		
	* Install of energy-efficient lighting (includes controls) and process systems such as water heaters, furnaces and boiler units.		
	* Install electrical outlets on the exterior walls of both the front and back of residences to promote the use of electric landscape maintenance equipment.		
	* Install electric vehicle recharging station with both conductive and inductive charging capabilities in residential garages / parking lots.		
	* Install a gas outlet for use with outdoor cooking appliances, and in any proposed fireplaces, including outdoor recreational fireplaces or pits.		
	* Use low energy street lights (i.e. sodium).		
	* Use low energy traffic signals (i.e. light emitting diode).		
	* Install Medium Efficiency Filters		
	* Install High Efficiency Filters		
	* Install HEPA (High Efficiency Particle Arrestance) Filters		
	* Install "whole-house" or "fresh-air" ventilation system		
	Telecommuting Infrastructure		
	Provide necessary infrastructure for telecommuting		
	* Provide fiber optic wiring and connections		

DRAFT

No.	Description	Selected? Y/N	Enforcement Mechanism or Justification for Non-Selection
14	<ul style="list-style-type: none"> * Provide T1 wiring and connections * Install a on-site telecommunications center Build new homes with internal wiring/cabling that allows telecommuting, teleconferencing, and telelearning to occur simultaneously in at least 3 locations in each home 		
	<p>Building Maintenance/Indoor Air Quality</p> <p>Reduce VOC emissions from Architectural Coatings</p> <ul style="list-style-type: none"> * Use Low-VOC Coatings * Use No-VOC Coatings 		
15	<ul style="list-style-type: none"> * Use No-VOC Coatings 		
16	<p>Install an ozone destruction catalyst on all air conditioning systems.</p>		
	<p>Landscaping</p> <p>Trees should be carefully selected and located to protect the building(s) from energy consuming environmental conditions and to shade paved areas</p> <p>Write and implement a Master Shading Plan which includes a maintenance plan.</p> <ul style="list-style-type: none"> * Plant Low-OFP, native, drought-resistant, tree and shrub species, 20% in excess of that already required by city or county ordinance. Consider roadside, sidewalk, and driveway shading 		
17	<p>Tree pruning should be consistent with the International Society of Arboriculture (ISA) and the American National Standards Institute (ANSI) standards</p>		
18	<p>Require landscape maintenance companies to use battery powered or electric equipment.</p> <p>Use structural soil under paved areas to improve tree growth</p>		
19	<p>Landscaping with low-emission native drought-resistant species (plants, trees and bushes) to reduce the demand for gas powered landscape maintenance equipment. Contact the District for a list of low-emission trees and shrubs.</p>		
20	<p>Require landscape maintenance companies to use battery powered or electric equipment.</p>		
21	<p>Use structural soil under paved areas to improve tree growth</p>		
22	<p>Landscaping with low-emission native drought-resistant species (plants, trees and bushes) to reduce the demand for gas powered landscape maintenance equipment. Contact the District for a list of low-emission trees and shrubs.</p>		
Operational Measures			
Telecommunication			
23	<p>Provide free-access telework terminals in multi-family projects</p>		
24	<p>Provide a community videoconferencing system coordinated with TMA.</p>		
Alternative Transit			
25	<p>Provide Guaranteed Ride Home</p>		
26	<p>Carpool Matching Assistance</p>		
27	<p>Provide Car-Sharing Services</p>		
28	<p>Transit pass subsidy (100%) and/or commute alternative allowance</p> <p>Provide a display case or kiosk displaying transportation information in a prominent area accessible to residents.</p> <ul style="list-style-type: none"> * Provide ridesharing information in a homeowner's association package. * Provide an opportunity to receive either a complimentary bicycle or electric bicycle retrofit kit to each residential buyer * Provide electric shuttle or minibus service to transit stops * Provide free transfers between all shuttles and transit. 		
29	<ul style="list-style-type: none"> * Operation of a shuttle bus to shopping, health care, public services sites and other nearby trip attractors to reduce automobile use. 		

DRAFT

No.	Description	Selected? Y/N	Enforcement Mechanism or Justification for Non-Selection
Landscaping			
	Project provides and/or requires use of electric maintenance equipment; including, but not limited to electric lawn mowers, electric leaf blowers, etc.		
30	<ul style="list-style-type: none"> * Prohibit gas powered landscape maintenance equipment within developments. * Provide battery powered or electric landscape maintenance equipment for new residences. 		

ATTACHMENT C - EXAMPLE

Common Air Pollutants

The following is a general description of the physical and health effects for air pollutants that could be emitted from the project or are known in the area.

Ozone

Ozone occurs in two layers of the atmosphere. The layer surrounding the earth's surface is the troposphere. Here, ground level or "bad" ozone is an air pollutant that damages human health, vegetation, and many common materials. It is a key ingredient of urban smog. The troposphere extends to a level about 10 miles up, where it meets the second layer, the stratosphere. The stratospheric or "good" ozone layer extends upward from about 10 to 30 miles and protects life on earth from the sun's harmful ultraviolet rays (UV-B).

"Bad" ozone is what is known as a photochemical pollutant. It needs reactive organic gases (ROG), oxides of nitrogen (NO_x), and sunlight. ROG and NO_x are emitted from various sources throughout Kern County. In order to reduce ozone concentrations, it is necessary to control the emissions of these ozone precursors.

Significant ozone formation generally requires an adequate amount of precursors in the atmosphere and several hours in a stable atmosphere with strong sunlight.

Ozone is a regional air pollutant. It is generated over a large area and is transported and spread by wind. Ozone, the primary constituent of smog, is the most complex, difficult to control, and pervasive of the criteria pollutants. Unlike other pollutants, ozone is not emitted directly into the air by specific sources. Ozone is created by sunlight acting on other air pollutants (called precursors), specifically NO_x and ROGs. Sources of precursor gases to the photochemical reaction that form ozone number in the thousands. Common sources include consumer products, gasoline vapors, chemical solvents, and combustion products of various fuels. Originating from gas stations, motor vehicles, large industrial facilities, and small businesses such as bakeries and dry cleaners, the ozone-forming chemical reactions often take place in another location, catalyzed by sunlight and heat. High ozone concentrations can form over large regions when emissions from motor vehicles and stationary sources are carried hundreds of miles from their origins. Approximately 50 million people lived in counties with air quality levels above U. S. EPA's health-based national air quality standard in 1994. The highest levels of ozone were recorded in Los Angeles. High levels also persist in other

heavily populated areas including the Texas Gulf Coast and much of the Northeast.

While the ozone in the upper atmosphere absorbs harmful ultraviolet light, ground-level ozone is damaging to the tissues of plants, animals, and humans, as well as to a wide variety of inanimate materials such as plastics, metals, fabrics, rubber, and paints. Societal costs from ozone damage include increased medical costs, the loss of human and animal life, accelerated replacement of industrial equipment, and reduced crop yields.

Health Effects

While ozone in the upper atmosphere protects the earth from harmful ultraviolet radiation, high concentrations of ground level ozone can adversely affect the human respiratory system. Many respiratory ailments, as well as cardiovascular disease, are aggravated by exposure to high ozone levels. Ozone also damages natural ecosystems such as forests and foothill communities, and damages agricultural crops and some man-made materials, such as rubber, paint, and plastics. High levels of ozone may negatively impact immune systems making people more susceptible to respiratory illnesses including bronchitis and pneumonia. Ozone also accelerates aging and exacerbates pre-existing asthma and bronchitis and in cases of high concentrations can lead to the development of asthma in active children. Active people, both children and adults, appear to be more at risk from ozone exposure than those with a low level of activity. Additionally, the elderly and those with respiratory disease are also considered sensitive populations for ozone.

People who work or play outdoors are at a greater risk for harmful health effects from ozone. Children and adolescents are also at greater risk, as they are more likely than adults to spend time engaged in vigorous activities. Research indicates that children under 12 years of age spend nearly twice as much time outdoors daily than adults. Teenagers spend at least twice as much time as adults in active sports and outdoor activities. Also, children inhale more air per pound of body weight than adults, and they breathe more rapidly than adults. Children are less likely than adults to notice their own symptoms and avoid harmful exposures.

Ozone is a powerful oxidant – it can be compared to household bleach, which can kill living cells (such as germs or human skin cells) upon contact. Ozone can damage the respiratory tract, causing inflammation and irritation, and it can induce symptoms such as coughing, chest tightness, shortness of breath, and worsening of asthma symptoms. Ozone in sufficient doses increases the permeability of lung cells, rendering them more susceptible to toxins and microorganisms. Exposure to levels of ozone above the current ambient air quality standard leads to lung inflammation and lung tissue damage, and a reduction in the

amount of air inhaled into the lungs. Recent evidence has, for the first time, linked the onset of asthma to exposure to elevated ozone levels in exercising children (McConnell, R., et. al. 2002). Elevated ozone concentrations also reduce crop and timber yields, damage native plants, and damage materials such as rubber, paints, fabric, and plastics (California Air Resources Board and American Lung Association of California, 2004).

Reactive Organic Gases and Volatile Organic Compounds

Hydrocarbons are organic gases that are formed solely of hydrogen and carbon. There are several subsets of organic gases including Volatile Organic Compounds (VOCs) and Reactive Organic Gases (ROGs). ROGs include all hydrocarbons except those exempted by the California Air Resources Board. Therefore, ROGs are a set of organic gases based on state rules and regulations. VOCs are similar to ROGs in that they include all organic gases except those exempted by federal law. The list of compounds exempt from the definition of VOC is included by the SJVAPCD and is presented in District Rule 1102. Both VOCs and ROGs are emitted from incomplete combustion of hydrocarbons or other carbon-based fuels. Combustion engine exhaust, oil refineries, and oil-fueled power plants are the primary sources of hydrocarbons. Another source of hydrocarbons is evaporation from petroleum fuels, solvents, dry cleaning solutions, and paint.

Health Effects

The primary health effects of hydrocarbons result from the formation of ozone and its related health effects (see ozone health effects discussion above). High levels of hydrocarbons in the atmosphere can interfere with oxygen intake by reducing the amount of available oxygen through displacement. There are no separate federal or California ambient air quality standards for ROG. Carcinogenic forms of ROG are considered toxic air contaminants (TACs). An example is benzene, which is a carcinogen. The health effects of individual ROGs are described below under the toxic air contaminants heading below.

Carbon Monoxide

Carbon monoxide (CO) is emitted by mobile and stationary sources as a result of incomplete combustion of hydrocarbons or other carbon-based fuels. CO is an odorless, colorless, poisonous gas that is highly reactive.

CO is a byproduct of motor vehicle exhaust, which contributes more than two-thirds of all CO emissions nationwide. In cities, automobile exhaust can cause as much as 95% of all CO emissions. These emissions can result in high concentrations of CO, particularly in local areas with heavy traffic congestion. Other sources of CO emissions include industrial processes and fuel combustion in sources such as boilers and incinerators. Despite an overall downward trend in concentrations and emissions of CO, some metropolitan areas still experience high levels of CO.

Health Effects

CO enters the bloodstream and binds more readily to hemoglobin than oxygen, reducing the oxygen-carrying capacity of blood, thus reducing oxygen delivery to organs and tissues. The health threat from CO is most serious for those who suffer from cardiovascular disease. Healthy individuals are also affected, but only at higher levels of exposure. Carbon monoxide binds strongly to hemoglobin, the oxygen-carrying protein in blood, and thus reduces the blood's capacity for carrying oxygen to the heart, brain, and other parts of the body. Exposure to carbon monoxide can cause chest pain in heart patients, headaches, and reduced mental alertness. At high concentrations, CO can cause heart difficulties in people with chronic diseases, and can impair mental abilities. Exposure to elevated CO levels is associated with visual impairment, reduced work capacity, reduced manual dexterity, poor learning ability, difficulty performing complex tasks, and in prolonged, enclosed exposure, death.

The adverse health effects associated with exposure to ambient and indoor concentrations of CO are related to concentration of carboxyhemoglobin (COHb) in the blood. Health effects observed may include early onset of cardiovascular disease, behavioral impairment; decreased exercise performance of young healthy men, reduced birth weight, Sudden Infant Death Syndrome (SIDS), and increased daily mortality rate (Fierro, M.D., et. al. 2001). Most of the studies evaluating adverse health effects of CO on the central nervous system examine high-level poisoning. Such poisoning results in symptoms ranging from common flu and cold symptoms (shortness of breath on mild exertion, mild headaches, and nausea) to unconsciousness and death. Hexter and Goldsmith report an association between daily death rate and exposure to ambient CO in Los Angeles County. They postulate a concentration of 20.2 ppm (the highest daily concentration recorded during a 4 year period) contributed 11 out of 159 deaths (Hexter, A. and J.R. Goldsmith, 1971). Additional studies conducted in

Los Angeles and Sao Paulo also suggest a relationship between daily death rates and CO concentrations (Kinney, P. and Ozkaynak, 1991; Saldivia, P.H., et. al. 1995).

Nitrogen Oxides

Nitrogen oxides (NO_x) are a family of highly reactive gases that are a primary precursor to the formation of ground-level ozone, and react in the atmosphere to form acid rain. NO_x is emitted from the use of solvents and combustion processes in which fuel is burned at high temperatures, principally from motor vehicle exhaust and stationary sources such as electric utilities and industrial boilers. A brownish gas, nitrogen dioxide is a strong oxidizing agent that reacts in the air to form corrosive nitric acid, as well as toxic organic nitrates.

Health Effects

NO_x is an ozone precursor that combines with ROG to form ozone. See the ozone section above for a discussion of the health effects of ozone.

Direct inhalation of NO_x can also cause a wide range of health effects. NO_x can irritate the lungs, cause lung damage, and lower resistance to respiratory infections such as influenza. Short-term exposures (e.g., less than 3 hours) to low levels of NO₂ may lead to changes in airway responsiveness and lung function in individuals with preexisting respiratory illnesses. These exposures may also increase respiratory illnesses in children. Long-term exposures to NO₂ may lead to increased susceptibility to respiratory infection and may cause irreversible alterations in lung structure. Other health effects associated with NO_x are an increase in the incidence of chronic bronchitis and lung irritation. Chronic exposure to nitrogen dioxide (NO₂) may lead to eye and mucus membrane aggravation, along with pulmonary dysfunction. NO_x can cause fading of textile dyes and additives, deterioration of cotton and nylon, and corrosion of metals due to production of particulate nitrates. Airborne NO_x can also impair visibility. NO_x is a major component of acid deposition in California. NO_x may affect both terrestrial and aquatic ecosystems. NO_x in the air is a potentially significant contributor to a number of environmental effects such as acid rain and eutrophication in coastal waters. Eutrophication occurs when a body of water suffers an increase in nutrients that reduce the amount of oxygen in the water, producing an environment that is destructive to fish and other animal life.

Nitrogen dioxide is toxic to various animals as well as to humans. Its toxicity relates to its ability to combine with water to form nitric acid in the eye, lung, mucus membranes and skin. Studies of the health impacts of NO₂ include experimental studies on animals, controlled laboratory studies on humans, and observational studies.

In animals, long-term exposure to NO_x increases susceptibility to respiratory infections lowering their resistance to such diseases as pneumonia and influenza. Laboratory studies show susceptible

humans, such as asthmatics, exposed to high concentrations of NO₂ can suffer lung irritation and potentially, lung damage.

Epidemiological studies have also shown associations between NO₂ concentrations and daily mortality from respiratory and cardiovascular causes and with hospital admissions for respiratory conditions.

NO_x contributes to a wide range of environmental effects directly and when combined with other precursors in acid rain and ozone. Increased nitrogen inputs to terrestrial and wetland systems can lead to changes in plant species composition and diversity. Similarly, direct nitrogen inputs to aquatic ecosystems such as those found in estuarine and coastal waters can lead to eutrophication (a condition that promotes excessive algae growth, which can lead to a severe depletion of dissolved oxygen and increased levels of toxins harmful to aquatic life). Nitrogen, alone or in acid rain, also can acidify soils and surface waters. Acidification of soils causes the loss of essential plant nutrients and increased levels of soluble aluminum that are toxic to plants. Acidification of surface waters creates conditions of low pH and levels of aluminum that are toxic to fish and other aquatic organisms. NO_x also contribute to visibility impairment. (U.S. EPA, 2005).

Particulate Matter

Particulate matter pollution consists of very small liquid and solid particles floating in the air. Some particles are large or dark enough to be seen as soot or smoke. Others are so small they can be detected only with an electron microscope. Particulate matter is a mixture of materials that can include smoke, soot, dust, salt, acids, and metals. Particulate matter also forms when gases emitted from motor vehicles and industrial sources undergo chemical reactions in the atmosphere. PM₁₀ refers to particles less than or equal to 10 microns in aerodynamic diameter. PM_{2.5} refers to particles less than or equal to 2.5 microns in aerodynamic diameter and are a subset of PM₁₀.

In the western United States, there are sources of PM₁₀ in both urban and rural areas. PM₁₀ and PM_{2.5} are emitted from stationary and mobile sources, including diesel trucks and other motor vehicles, power plants, industrial processing, wood burning stoves and fireplaces, wildfires, dust from roads, construction, landfills, and agriculture, and fugitive windblown dust. Because particles originate from a variety of sources, their chemical and physical compositions vary widely.

Health Effects

PM₁₀ and PM_{2.5} particles are small enough – about 1/7th the thickness of a human hair, or smaller– to be inhaled into, and lodge in, the deepest parts of the lung, evading the respiratory system's natural defenses. Health problems begin as the body reacts to these foreign particles.

Acute and chronic health effects associated with high particulate levels include the aggravation of chronic respiratory diseases, heart and lung disease, and coughing, bronchitis, and respiratory illnesses in children. Recent mortality studies have shown a statistically significant direct association between mortality and daily concentrations of particulate matter in the air. Non health-related effects include reduced visibility and soiling of buildings. PM10 can increase the number and severity of asthma attacks, cause or aggravate bronchitis and other lung diseases, and reduce the body's ability to fight infections. PM10 and PM2.5 can aggravate respiratory disease, and cause lung damage, cancer, and premature death.

Although particulate matter can cause health problems for everyone, certain people are especially vulnerable to adverse health effects of PM10. These "sensitive populations" include children, the elderly, exercising adults, and those suffering from chronic lung disease such as asthma or bronchitis. Of greatest concern are recent studies that link PM10 exposure to the premature death of people who already have heart and lung disease, especially the elderly. Acidic PM10 can also damage manmade materials and is a major cause of reduced visibility in many parts of the U.S.

Premature deaths linked to particulate matter are now at levels comparable to deaths from traffic accidents and second-hand smoke. One of the most dangerous pollutants, fine particulate matter (e.g., from diesel exhaust and fireplace soot) not only bypasses the body's defense mechanisms and becomes embedded in the deepest recesses of the lung, but also can disrupt cellular processes. Population based studies in hundreds of cities in the U.S. and around the world have demonstrated a strong link between elevated particulate levels and premature deaths, hospital admissions, emergency room visits, and asthma attacks. Long-term studies of children's health conducted in California have demonstrated that particulate pollution may significantly reduce lung function growth in children (California Air Resources Board, 2002).

Attaining the California PM standards would annually prevent about 6,500 premature deaths, or 3% of all deaths. These premature deaths shorten lives by an average of 14 years. This is roughly equivalent to the same number of deaths (4,200-7,400) linked to second hand smoke in the year 2000. In comparison, motor vehicle crashes cause 3,200 deaths and homicides were responsible for 2,000 deaths. Attaining the California PM and ozone standards would annually prevent 4,000 hospital admissions for respiratory disease, 3,000 hospital admissions for cardiovascular disease, and 2,000 asthma-related emergency room visits. Exposure to diesel PM causes about 250 excess cancer cases per year in California. (California Air Resources Board, 2002).

A recent study provides evidence that exposure to particulate air pollution is associated with lung cancer. This study found that residents who live in an area that is severely impacted by particulate

air pollution are at risk of lung cancer at a rate comparable to non-smokers exposed to second-hand smoke. This study also found an approximately 16 percent excess risk of dying from lung cancer due to fine particulate air pollution (Pope, C.A., III, et. al. 2002).

Another study shows that individuals with existing cardiac disease can be in a potentially life-threatening situation when exposed to high levels of ultrafine air pollution. Fine particles can penetrate the lungs and may cause the heart to beat irregularly or can cause inflammation, which could lead to a heart attack (Peters, A., et. al., 2001);

Currently, 61% of California's population live in areas that exceed the federal PM_{2.5} air standard, while 89% live in areas that exceed California's PM_{2.5} air standard (California Air Resources Board, 2004).

Other Pollutants

- **Sulfur Dioxide.** Sulfur dioxide (SO₂) is a colorless, irritating gas with a "rotten egg" smell formed primarily by the combustion of sulfur-containing fossil fuels. Historically, in the late 1970's in the SJVAB portion of Kern County, SO₂ was a pollutant of concern but with the successful application of regulations, the levels have been reduced significantly. In fact, the latest data from the CARB demonstrates that the highest 1-hour concentration for SO₂ was 0.011 ppm. With the CAAQS being 0.25 ppm, SO₂ concentrations in the SJVAB are only about 4 percent of the standard.

High concentrations of SO₂ can result in temporary breathing impairment for asthmatic children and adults who are active outdoors. Short-term exposures of asthmatic individuals to elevated SO₂ levels during moderate activity may result in breathing difficulties that can be accompanied by symptoms such as wheezing, chest tightness, or shortness of breath. Other effects that have been associated with longer-term exposures to high concentrations of SO₂, in conjunction with high levels of PM, include aggravation of existing cardiovascular disease, respiratory illness, and alterations in the lungs' defenses. SO₂ also is a major precursor to PM_{2.5}, which is a significant health concern, and a main contributor to poor visibility. (See also the discussion of health effects of particulate matter).

Sulfur dioxide not only has a bad odor, it can irritate the respiratory system. Exposure to high concentrations for short periods of time can constrict the bronchi and increase mucous flow, making breathing difficult. Sulfur dioxide can also:

- Immediately irritate the lung and throat at concentrations greater than 6 parts per million (ppm) in many people.

- Impair the respiratory system's defenses against foreign particles and bacteria, when exposed to concentrations less than 6 ppm for longer time periods.
- Enhance the harmful effects of ozone. (Combinations of the two gases at concentrations occasionally found in the ambient air appear to increase airway resistance to breathing.)
- Sulfur dioxide tends to have more toxic effects when acidic pollutants, liquid or solid aerosols, and particulates are also present. (In the 1950s and 1960s, thousands of excess deaths occurred in areas where SO₂ concentrations exceeded 1 ppm for a few days and other pollutants were also high.) Effects are more pronounced among mouth breathers, e.g., people who are exercising or who have head colds. These effects include:
 - Health problems, such as episodes of bronchitis requiring hospitalization associated with lower-level acid concentrations.
 - Self-reported respiratory conditions, such as chronic cough and difficult breathing, associated with acid aerosol concentrations. (Asthmatic individuals are especially susceptible to these effects. The elderly and those with chronic respiratory conditions may also be affected at lower concentrations than the general population.)
 - Increased respiratory tract infections, associated with longer term, lower-level exposures to SO₂ and acid aerosols.
 - Subjective symptoms, such as headaches and nausea, in the absence of pathological abnormalities, due to long-term exposure.
 - Sulfur dioxide easily injures many plant species and varieties, both native and cultivated. Some of the most sensitive plants include various commercially valuable pines, legumes, red and black oaks, white ash, alfalfa and blackberry. The effects include:
 - Visible injury to the most sensitive plants at exposures as low as 0.12 ppm for 8 hours.
 - Visible injury to many other plant types of intermediate sensitivity at exposures of 0.30 ppm for 8 hours.
 - Positive benefits from low levels, in a very few species growing on sulfur deficient soils.
 - Increases in sulfur dioxide concentrations accelerate the corrosion of metals, probably through the formation of acids. (SO₂ is a major precursor to acidic deposition.) Sulfur oxides may also damage stone and masonry, paint, various fibers, paper, leather, and electrical components.
 - Increased SO₂ also contributes to impaired visibility. Particulate sulfate, much of which is derived from sulfur dioxide emissions, is a major component of the complex total suspended particulate mixture.
- **Sulfates.** Sulfates are particulate products of combustion of sulfur-containing fossil fuels. When SO or SO₂ are exposed to oxygen it precipitates out into sulfates (SO₃ or SO₄). Data collected in Kern

County identify levels of sulfates that are significantly less than the applicable health standards.

Sulfates (SO_4^{2-}) are the fully oxidized ionic form of sulfur. Sulfates occur in combination with metal and / or hydrogen ions. In California, emissions of sulfur compounds occur primarily from the combustion of petroleum-derived fuels (e.g., gasoline and diesel fuel) that contain sulfur. This sulfur is oxidized to sulfur dioxide (SO_2) during the combustion process and subsequently converted to sulfate compounds in the atmosphere. The conversion of SO_2 to sulfates takes place comparatively rapidly and completely in urban areas of California due to regional meteorological features.

The ARB's sulfates standard is designed to prevent aggravation of respiratory symptoms. Effects of sulfate exposure at levels above the standard include a decrease in ventilatory function, aggravation of asthmatic symptoms, and an increased risk of cardio-pulmonary disease. Sulfates are particularly effective in degrading visibility, and, due to fact that they are usually acidic, can harm ecosystems and damage materials and property (California Air Resources Board, 2005.)

- **Lead.** Lead is a metal that is a natural constituent of air, water, and the biosphere. Lead is neither created nor destroyed in the environment, so it essentially persists forever. Lead was used until recently to increase the octane rating in auto fuel. Since gasoline-powered automobile engines were a major source of airborne lead through the use of leaded fuels and the use of leaded fuel has been mostly phased out, the ambient concentrations of lead have dropped dramatically. Kern County no longer monitors lead in the ambient air of the SJVAB.

Exposure to lead occurs mainly through inhalation of air and ingestion of lead in food, water, soil, or dust. It accumulates in the blood, bones, and soft tissues and can adversely affect the kidneys, liver, nervous system, and other organs. Excessive exposure to lead may cause neurological impairments such as seizures, mental retardation, and behavioral disorders. Even at low doses, lead exposure is associated with damage to the nervous systems of fetuses and young children, resulting in learning deficits and lowered IQ. Recent studies also show that lead may be a factor in high blood pressure and subsequent heart disease. Lead can also be deposited on the leaves of plants, presenting a hazard to grazing animals and humans through ingestion (U.S. EPA 2005a).

- **Hydrogen Sulfide.** Hydrogen sulfide (H_2S) is associated with geothermal activity, oil and gas production, refining, sewage treatment plants, and confined animal feeding operations.

Exposure to low concentrations of hydrogen sulfide may cause irritation to the eyes, nose, or throat. It may also cause difficulty in breathing for some asthmatics. Exposure to higher concentrations

(above 100 parts per million [ppm]), can cause olfactory fatigue, respiratory paralysis, and death. Brief exposures to high concentrations of hydrogen sulfide (greater than 500 ppm) can cause a loss of consciousness. In most cases, the person appears to regain consciousness without any other effects. However, in many individuals, there may be permanent or long-term effects such as headaches, poor attention span, poor memory, and poor motor function. No health effects have been found in humans exposed to typical environmental concentrations of hydrogen sulfide (0.00011-0.00033 ppm). Deaths due to breathing in large amounts of hydrogen sulfide have been reported in a variety of different work settings, including sewers, animal processing plants, waste dumps, sludge plants, oil and gas well drilling sites, and tanks and cesspools

- **Visibility Reducing Particles.** This standard is a measure of visibility. The CARB does not yet have a measuring method with enough accuracy or precision to designate areas in the State attainment or non-attainment. The entire State is labeled unclassified.
- **Vinyl Chloride.** Vinyl chloride monomer is a sweet smelling, colorless gas at ambient temperature. Landfills, publicly owned treatment works and PVC production are the major identified sources of vinyl chloride emissions in California. Polyvinyl chloride (PVC) can be fabricated into several products such as PVC pipes, pipefittings, and plastics. In humans, epidemiological studies of occupationally exposed workers have linked vinyl chloride exposure to development of a rare cancer, liver angiosarcoma, and have suggested a relationship between exposure and lung and brain cancers. There are currently no adopted ambient air standards for vinyl chloride.

Short-term exposure to vinyl chloride has been linked with the following acute health effects (Agency for Toxic Substances and Disease Registry, 1997; Agency for Toxic Substances and Disease Registry, 1990; U.S. Department of Health and Human Services, 1993):

Acute exposure of humans to high levels of vinyl chloride via inhalation in humans has resulted in effects on the central nervous system, such as dizziness, drowsiness, headaches, and giddiness.

Vinyl chloride is reported to be slightly irritating to the eyes and respiratory tract in humans. Acute exposure to extremely high levels of vinyl chloride has caused loss of consciousness, lung and kidney irritation, and inhibition of blood clotting in humans and cardiac arrhythmias in animals.

Tests involving acute exposure of mice have shown vinyl chloride to have high acute toxicity from inhalation exposure.

Long-term exposure to vinyl chloride concentrations has been linked with the following chronic health effects (Agency for Toxic Substances and Disease Registry, 1997; U.S. Department of Health and Human Services. Registry of Toxic Effects of Chemical Substances (RTECS, online database). 1993; U.S. Department of Health and Human Services. 1993; U.S. Environmental Protection Agency.1997):

- Liver damage may result in humans from chronic exposure to vinyl chloride, through both inhalation and oral exposure.
- A small percentage of individuals occupationally exposed to high levels of vinyl chloride in air have developed a set of symptoms termed "vinyl chloride disease," which is characterized by Raynaud's phenomenon (fingers blanch and numbness and discomfort are experienced upon exposure to the cold), changes in the bones at the end of the fingers, joint and muscle pain, and scleroderma-like skin changes (thickening of the skin, decreased elasticity, and slight edema).
- Central nervous system effects (including dizziness, drowsiness, fatigue, headache, visual and/or hearing disturbances, memory loss, and sleep disturbances) as well as peripheral nervous system symptoms (peripheral neuropathy, tingling, numbness, weakness, and pain in fingers) have also been reported in workers exposed to vinyl chloride.

Several reproductive/developmental health effects from vinyl chloride exposure have been identified (Agency for Toxic Substances and Disease Registry (ATSDR). 1990; U.S. Department of Health and Human Services. Registry of Toxic Effects of Chemical Substances (RTECS, online database). 1993). They include:

- Several case reports suggest that male sexual performance may be affected by vinyl chloride. However, these studies are limited by lack of quantitative exposure information and possible co-occurring exposure to other chemicals.
- Several epidemiological studies have reported an association between vinyl chloride exposure in pregnant women and an increased incidence of birth defects, while other studies have not reported similar findings.
- Epidemiological studies have suggested an association between men occupationally exposed to vinyl chloride and miscarriages in their wives' pregnancies although other studies have not supported these findings.

- Long term exposure to vinyl chloride has also been identified as a cancer risk (Agency for Toxic Substances and Disease Registry (ATSDR), 1990; U.S. Department of Health and Human Services. Registry of Toxic Effects of Chemical Substances (RTECS, online database). 1993; ¹U.S. Department of Health and Human Services. Hazardous Substances Data Bank ([HSDB, online database](#)). 1993; U.S. Environmental Protection Agency. 1997.)
 - Inhaled vinyl chloride has been shown to increase the risk of a rare form of liver cancer (angiosarcoma of the liver) in humans.
 - Animal studies have shown that vinyl chloride, via inhalation, increases the incidence of angiosarcoma of the liver and cancer of the liver.
- **Toxic Air Contaminants.** Hazardous air pollutants is a term used by the federal Clean Air Act that includes a variety of pollutants generated or emitted by industrial production activities. Called Toxic Air Contaminants (TAC) under the California Clean Act, ten have been identified through ambient air quality data as being the most substantial health risk in California. Direct exposure to these pollutants has been shown to cause cancer, birth defects, damage to brain and nervous system and respiratory disorders. The California Air Resources Board provides emission inventories for only the larger Air Basins.

The [INSERT APPLICABLE AIR BASIN] shows the following tons per year (tpy) emissions for the year XXXX for the ten TACs: acetaldehyde (X tpy), benzene (X tpy), 1,3-butadiene (X tpy), carbon tetrachloride (<X tpy), chromium (hexavalent), (X tpy), para-dichlorobenzene (X tpy), formaldehyde (X tpy), methylene chloride (X tpy), perchloroethylene (X tpy), and diesel particulate matter (X tpy). Approximately XX % of acetaldehyde emissions are from mobile sources, with area sources such as residential wood combustion accounting for approximately XX% of total emissions. The primary sources of benzene in the [INSERT APPLICABLE AIR BASIN] include mobile sources (XX%) and stationary sources (XX%)

Approximately XX% of Hexavalent chromium emissions are from stationary sources such as electrical generation, aircraft and parts manufacturing and fabricated metal produce manufacturing.

Approximately XX % of 1.3 –butadiene emissions are from mobile sources. Emissions of carbon tetrachloride are all produced by stationary sources such as chemical and allied produce manufactures. Most of the emissions of para- dichlorobenzene are from consumer products such as non-aerosol insect repellents and solid/gel air fresheners. Approximately XX % of formaldehyde emissions in the [APPLICABLE BASIN] are from mobile sources, while XX% of methylene chloride emissions are from paint removers/strippers, automotive brake cleaners, and other

consumer products. Perchloroethylene is produced primarily from stationary sources such as dry cleaning plants and manufacturing of aircraft parts and fabricated metal parts. Emissions of diesel particulate matter are from mobile sources (XX%) and stationary sources (XX%)

TACs do not have ambient air quality standards. Since no safe levels of TACs can be determined, there are no air quality standards for TACs. Instead, TAC impacts are evaluated by calculating the health risks associated with a given exposure. The requirements of the Air Toxic "Hot Spots" Information and Assessment Act apply to facilities that use, produce, or emit toxic chemicals. Facilities that are subject to the toxic emission inventory requirements of the Act must prepare and submit toxic emission inventory plans and reports, and periodically update those reports. Of the XX Air Basin facilities that have been deemed to pose significant health risks under the Act, XX have subsequently reduced those risks to a level no longer considered significant under the standards of the "Hot Spots" program.

HEALTH EFFECTS of the TACs

Health Risks - Acetaldehyde

Acetaldehyde is both directly emitted into the atmosphere and formed in the atmosphere from photochemical oxidation. Sources includes combustion processes such as exhaust from mobile sources and fuel combustion from stationary internal combustion engines, boilers, and process heaters.

Acetaldehyde is classified as a federal hazardous air pollutant and as a California TAC. Acetaldehyde is a carcinogen that also causes chronic non-cancer toxicity in the respiratory system. Symptoms of chronic intoxication of acetaldehyde in humans resemble those of alcoholism.

The primary acute effect of inhalation exposure to acetaldehyde is irritation of the eyes, skin, and respiratory tract in humans. At higher exposure levels, erythema, coughing, pulmonary edema, and necrosis may also occur. Acute inhalation of acetaldehyde resulted in a depressed respiratory rate and elevated blood pressure in experimental animals. Tests involving acute exposure of rats, rabbits, and hamsters have demonstrated acetaldehyde to have low acute toxicity from inhalation and moderate acute toxicity from oral or dermal exposure (U.S. EPA, 2005).

Health Risks - Benzene

Approximately 84 percent of the benzene emitted in California comes from motor vehicles, including evaporative leakage and unburned fuel exhaust. Currently, the benzene content of gasoline is less than one percent.

Benzene is highly carcinogenic and occurs throughout California. Benzene also has non-cancer health effects. Brief inhalation exposure to high concentrations can cause central nervous system depression. Acute effects include central nervous system symptoms of nausea, tremors, drowsiness, dizziness, headache, intoxication, and unconsciousness (California Environmental Protection Agency and Air Resources Board, 2005).

Neurological symptoms of inhalation exposure to benzene include drowsiness, dizziness, headaches, and unconsciousness in humans. Ingestion of large amounts of benzene may result in vomiting, dizziness, and convulsions in humans. Exposure to liquid and vapor may irritate the skin, eyes, and upper respiratory tract in humans. Redness and blisters may result from dermal exposure to benzene.

Chronic inhalation of certain levels of benzene causes disorders in the blood in humans. Benzene specifically affects bone marrow (the tissues that produce blood cells). Aplastic anemia, excessive bleeding, and damage to the immune system (by changes in blood levels of antibodies and loss of white blood cells) may develop. Increased incidence of leukemia (cancer of the tissues that form white blood cells) has been observed in humans occupationally exposed to benzene (U.S. EPA, 2005b).

Health Risks - 1,3 –Butadiene

The majority of 1,3-butadiene emissions come from incomplete combustion of gasoline and diesel fuels. Mobile sources account for 83 percent of total statewide emissions. Area wide sources such as agricultural waste burning and open burning contribute approximately 13 percent of statewide emissions.

1,3-Butadiene has been identified as a carcinogen in California. Butadiene vapors cause neurological effects at very high levels such as blurred vision, fatigue, headache, and vertigo. Dermal exposure of humans to 1,3-butadiene causes a sensation of cold, followed by a burning sensation, which may lead to frostbite (California Environmental Protection Agency Air Resources Air Resources Board, 2005).

One epidemiological study reported that chronic (long-term) exposure to 1,3-butadiene via inhalation resulted in an increase in cardiovascular diseases, such as rheumatic and arteriosclerotic heart diseases, while other human studies have reported effects on the blood. A large epidemiological study of synthetic rubber industry workers demonstrated a consistent association between 1,3-butadiene exposure and occurrence of leukemia. Several epidemiological studies of workers in styrene-butadiene rubber factories have shown an increased incidence of respiratory, bladder, stomach, and lymphato-hematopoietic cancers. However, these studies are not sufficient to determine a causal association between 1,3-butadiene exposure and cancer due to possible

exposure to other chemicals and other confounding factors (U.S. EPA, 2005c).

Health Risks - Carbon Tetrachloride

The primary sources of carbon tetrachloride in California include chemical and allied product manufacturers and petroleum refineries.

In California, carbon tetrachloride has been identified as a carcinogen. Carbon tetrachloride is also a central nervous system depressant and mild eye and respiratory tract irritant (California Environmental Protection Agency Air Resources Board, 2005). EPA has classified carbon tetrachloride as a Group B2, probable human carcinogen (U.S. EPA, 2005d).

Acute inhalation and oral exposures to high levels of carbon tetrachloride have been observed primarily to damage the liver (swollen, tender liver, changes in enzyme levels, and jaundice) and kidneys (nephritis, nephrosis, proteinuria) of humans. Depression of the central nervous system has also been reported. Symptoms of acute exposure in humans include headache, weakness, lethargy, nausea, and vomiting. Delayed pulmonary edema (fluid in lungs) has been observed in humans exposed to high levels of carbon tetrachloride by inhalation and ingestion, but this is believed to be due to injury to the kidney rather than direct action of carbon tetrachloride on the lung. Chronic inhalation or oral exposure to carbon tetrachloride produces liver and kidney damage in humans and animals (U.S. EPA, 2005d).

Health Risks - Chromium, Hexavalent

Chromium plating and other metal finishing processes are the primary sources of hexavalent chromium emissions in California. In California, hexavalent chromium has been identified as a carcinogen. There is epidemiological evidence that exposure to inhaled hexavalent chromium may result in lung cancer. The principal acute effects are renal toxicity, gastrointestinal hemorrhage, and intravascular hemolysis (California Environmental Protection Agency Air Resources Air Resources Board).

The respiratory tract is the major target organ for chromium (VI) following inhalation exposure in humans. Other effects noted from acute inhalation exposure to very high concentrations of chromium (VI) include gastrointestinal and neurological effects, while dermal exposure causes skin burns in humans. Chronic inhalation exposure to chromium (VI) in humans results in effects on the respiratory tract, with perforations and ulcerations of the septum, bronchitis, decreased pulmonary function, pneumonia, asthma, and nasal itching and soreness reported. Chronic human exposure to high levels of chromium (VI) by inhalation or oral exposure may produce effects on the liver, kidney, gastrointestinal and immune systems, and possibly the blood (U.S. EPA 2005e).

Health Risks - Para-Dichlorobenzene

The primary sources of para-dichlorobenzene include consumer products such as non-aerosol insect repellents and solid/gel air fresheners. These sources contribute 99% of statewide para-dichlorobenzene emissions.

In California, para-dichlorobenzene has been identified as a carcinogen. Acute exposure to 1,4-dichlorobenzene via inhalation in humans results in irritation to the eyes, skin, and throat. In addition, long-term inhalation exposure may affect the liver, skin, and central nervous system in humans (e.g., cerebellar ataxia, dysarthria, weakness in limbs, and hyporeflexia). (California Environmental Protection Agency Air Resources Air Resources Board, 2005; U.S. EPA, 2005f).

Health Risks - Formaldehyde

Formaldehyde is both directly emitted into the atmosphere and formed in the atmosphere as a result of photochemical oxidation. Formaldehyde is a product of incomplete combustion. One of the primary sources of formaldehyde is vehicular exhaust. Formaldehyde is also used in resins, can be found in many consumer products as an antimicrobial agent, and is used in fumigants and soil disinfectants.

The major toxic effects caused by acute formaldehyde exposure via inhalation are eye, nose, and throat irritation and effects on the nasal cavity. Other effects seen from exposure to high levels of formaldehyde in humans are coughing, wheezing, chest pains, and bronchitis. Chronic exposure to formaldehyde by inhalation in humans has been associated with respiratory symptoms and eye, nose, and throat irritation. Animal studies have reported effects on the nasal respiratory epithelium and lesions in the respiratory system from chronic inhalation exposure to formaldehyde. Occupational studies have noted statistically significant associations between exposure to formaldehyde and increased incidence of lung and nasopharyngeal cancer. This evidence is considered to be "limited," rather than "sufficient," due to possible exposure to other agents that may have contributed to the excess cancers. EPA considers formaldehyde to be a probable human carcinogen (cancer-causing agent) and has ranked it in EPA's Group B1. In California, formaldehyde has been identified as a carcinogen. (California Environmental Protection Agency Air Resources Air Resources Board, 2005; U.S. EPA, 2005g).

Health Risks - Methylene Chloride

Methylene chloride is used as a solvent, a blowing and cleaning agent in the manufacture of polyurethane foam and plastic manufacture, and as a solvent in paint stripping operations. Paint removers account for the largest use of methylene chloride in California.

Case studies of methylene chloride poisoning during paint stripping operations have demonstrated that inhalation exposure to extremely high levels can be fatal to humans. Acute inhalation exposure to high levels of methylene chloride in humans has resulted in effects on the central nervous system (CNS) including decreased visual, auditory, and psychomotor functions, but these effects are reversible once exposure ceases. Methylene chloride also irritates the nose and throat at high concentrations. The major effects from chronic inhalation exposure to methylene chloride in humans are effects on the central nervous system, such as headaches, dizziness, nausea, and memory loss. In addition, chronic exposure can lead to bone marrow, hepatic, and renal toxicity. EPA considers methylene chloride to be a probable human carcinogen and has ranked it in EPA's Group B2. California considers methylene chloride to be carcinogenic.(U.S. EPA, 2005h).

Health Risks - Perchloroethylene

Perchloroethylene is used as a solvent, primarily in dry cleaning operations. Perchloroethylene is also used in degreasing operations, paints and coatings, adhesives, aerosols, specialty chemical production, printing inks, silicones, rug shampoos, and laboratory solvents.

In California, perchloroethylene has been identified as a carcinogen. Perchloroethylene vapors are irritating to the eyes and respiratory tract. Following chronic exposure, workers have shown signs of liver toxicity, as well as kidney dysfunction, and neurological disorders (California Environmental Protection Agency Air Resources Board, 2005)

Health Risks - Diesel Particulate Matter

Diesel particulate matter is emitted from both mobile and stationary sources. In California, on-road diesel fueled engines contribute approximately 24 percent of the statewide total, with an additional 71 percent attributed to other mobile sources such as construction and mining equipment, agricultural equipment, and transport refrigeration units. Stationary sources contribute about 5 percent of total diesel particulate matter.

Diesel exhaust and many individual substances contained in it (including arsenic, benzene, formaldehyde and nickel) have the potential to contribute to mutations in cells that can lead to cancer. Long-term exposure to diesel exhaust particles poses the highest cancer risk of any toxic air contaminant evaluated by the California Office of Environmental Health Hazard Assessment (OEHHA). ARB estimates that about 70 percent of the cancer risk that the average Californian faces from breathing toxic air pollutants stems from diesel exhaust particles.

In its comprehensive assessment of diesel exhaust, OEHHA analyzed more than 30 studies of people who worked around diesel equipment, including truck drivers, railroad workers and equipment operators. The studies showed these workers were more likely to develop lung cancer than workers who were not exposed to diesel emissions. These studies provide strong evidence that long-term occupational exposure to diesel exhaust increases the risk of lung cancer. Using information from OEHHA's assessment, ARB estimates that diesel-particle levels measured in California's air in 2000 could cause 540 "excess" cancers (beyond what would occur if there were no diesel particles in the air) in a population of 1 million people over a 70-year lifetime. Other researchers and scientific organizations, including the National Institute for Occupational Safety and Health, have calculated cancer risks from diesel exhaust that are similar to those developed by OEHHA and ARB.

Exposure to diesel exhaust can have immediate health effects. Diesel exhaust can irritate the eyes, nose, throat and lungs, and it can cause coughs, headaches, lightheadedness and nausea. In studies with human volunteers, diesel exhaust particles made people with allergies more susceptible to the materials to which they are allergic, such as dust and pollen. Exposure to diesel exhaust also causes inflammation in the lungs, which may aggravate chronic respiratory symptoms and increase the frequency or intensity of asthma attacks.

Diesel engines are a major source of fine-particle pollution. The elderly and people with emphysema, asthma, and chronic heart and lung disease are especially sensitive to fine-particle pollution (see also health effects discussion in Section 4.3.4.5). Numerous studies have linked elevated particle levels in the air to increased hospital admissions, emergency room visits, asthma attacks and premature deaths among those suffering from respiratory problems. Because children's lungs and respiratory systems are still developing, they are also more susceptible than healthy adults to fine particles. Exposure to fine particles is associated with increased frequency of childhood illnesses and can also reduce lung function in children. In California, diesel exhaust particles have been identified as a carcinogen (California Office of Environmental Health Hazard Assessment and the American Lung Association, 2005; California Environmental Protection Agency Air Resources Board, 2005).

ATTACHMENT D – FORMAT

Table 4.2-XX- Emission Inventory SJVAB 2020 Projection – Tons per Year

	ROG	NO_x	PM₁₀
Total Emissions	143,744.3	115,208.6	234,151.1
	0	0	5
Percent stationary sources	28%	55%	8%
Percent area-wide sources	53%	3%	89%
Percent mobile sources	18%	41%	2%
Percent natural sources	17%	<1%	1%
Total Stationary Source Emissions	40,653.70	62,995.35	19,217.25
Total Area-Wide Source Emissions	74,496.70	3,759.50	207,327.3
			0
Total Mobile Source Emissions	25,805.50	47,746.75	4,442.05
Total Natural Source Emissions	788.40	657.00	3,164.55

Source: California Air Resources Board, 2005

Table 4.2-XX Emission Inventory SJVAB – Kern County Portion 2020 Estimate Projection – Tons per Year

	ROG	NO_x	PM₁₀
Total Emissions	32,952.20	38,609.75	35,613.05
Percent stationary sources	56%	74%	13%
Percent area-wide sources	25%	1%	83%
Percent mobile sources	18%	24%	2%
Percent natural sources	<1%	<1%	2%
Total Stationary Source Emissions	18,286.50	28,491.90	4,588.05
Total Area-Wide Source Emissions	8,416.90	518.30	29,459.15
Total Mobile Source Emissions	5,971.40	9,460.80	810.30
Total Natural Source Emissions	277.40	138.70	755.55

Source: California Air Resources Board, 2005.

Table 4.2-XX. 2020 Emissions Projections – {PROJECT}, Kern County, and San Joaquin Valley Air Basin

	ROG	NO_x	PM₁₀
PROJECT NAME	32.2	29.8	27.3
Kern County	32,952.20	38,609.75	35,613.05
San Joaquin Valley Air Basin	143,744.30	115,208.60	234,151.15
Project Name Percent of Kern County	0.1%	0.08%	0.08%
Project Name Percent of SJVAB	0.02%	0.03%	0.01%
Kern County Percent of SJVAB	23%	34%	15%

	ROG	NO_x	PM₁₀
Notes: The emission estimates for Kern County and the SJVAB are based on 2020 projections. The Project Name emission estimates are for the expected buildout year of XXX. Project Name emissions would be 30 to 40% lower in 2020 as cleaner, less polluting vehicles replace vehicles with higher emissions.			